# **IABSE Congress San Jose 2024**

Beyond Structural Engineering in a Changing World

San Jose, Costa Rica 25-27 September 2024

Volume 1 of 2

ISBN: 979-8-3313-0718-9

#### Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2024) by International Association for Bridge and Structural Engineering (IABSE) All rights reserved.

Printed with permission by Curran Associates, Inc. (2024)

For permission requests, please contact International Association for Bridge and Structural Engineering (IABSE) at the address below.

International Association for Bridge and Structural Engineering (IABSE) Jungholzstrasse 28 8050 Zürich Switzerland

Phone: +41 44 633 2647 Fax: +41 44 633 1241

secretariat@iabse.org

http://www.iabse.org

#### Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA

Phone: 845-758-0400 Fax: 845-758-2633

Email: curran@proceedings.com Web: www.proceedings.com



# **Table of Content**

	ICE			
	ntific Committee	1 1		
Organizing Committee and Partners				
List o	of Sponsors and Exhibitors	1		
-	ning Speeches	1		
	ote Lectures	1		
	ion Plan	1		
Full F	Papers	3		
1A De	e-constructability and Second Use			
74	Do we need normative guidance on the design of reused structural components? On the contribution of			
	structural and bridge engineering to solve global challenges	3		
122	Geneva St Ramp: Replacement of Steel Girder Bridge with Post-Tensioned Concrete Structure on Existing			
	Foundations	4		
209	Component management for structural reuse	5		
213	Advancements in Lightweight Cold-Formed Composite Steel-Concrete Floor Systems: Recent Findings from the LWT-FLOOR Project	6		
214	Bond behaviour of concrete with fine recycled aggregate	7		
54	The second life of railway bridges	8		
1D E-	om Design to Construction			
18 Fr		8		
	Design of the Bataan-Cavite Interlink Bridge (BCIB) Project in The Philippines	•		
27	Bond behaviour and crack development in non-metallic textile-reinforced concrete members under cyclic loading with regard to serviceability	ç		
32	Seismic behavior of steel beam to box column connections	10		
32 42	Flexural experimental assessment of ductility of SFRC beams using longitudinal reinforcing bars	11		
	Applications of HLMR Disk Bearings on Light Rail Structures	12		
1 196	Assessment of Deflection Distribution in Synthetic Plate Girder Bridge Concrete Decks through Impact	12		
190	Vibration	13		
	ustainability			
90	Reconstruction of a masonry bridge in Deba (Spain)	13		
144	Utilization of Precipitated Calcium Carbonate (PCC) and Upcycled Recycled Concrete Aggregate			
	(Upcycled RCA or UCA) in Civil Engineering: Laboratory Experiments and Engineering Properties			
	Assessment	14		
192	Mathematical Approach for Optimizing Material Reusability in Construction	15		
233	Experimental investigations on the load-bearing capacity of tunnel segments – Evaluation of the resource			
	eciciency of large-scale test specimens	16		
331	Multi-objective optimization of pavement networks using Tracic Management System (TMS)	17		
336	Assessment Of The Seismic Performance Of A Viaduct In Mexico City	18		
1D Re	ehabilitation of Existing Structures			
2	Seismic assessment of existing bridges: shortcomings vs hidden reserves	19		
23	Application of pushover analysis in seismic assessment of 50 years old bridge	20		
25	Review of the Asset Management, Inspection and Rehabilitation Work Required to Maintain Two			
	Suspension Bridges, Angus L. Macdonald and A. Murray MacKay, in Halifax, Nova Scotia (Canada)	20		
26	Inspection, Analysis, Diagnosis and Recommendations for Repairs for Two Suspension Bridges in the			
	Patagonia Region of Chile	21		
5	Extending the service life of existing concrete bridges using improved assessment methods	22		
96	Alternative replacement option for medium-span bridge with the Hybrid Decked Bulb Tee	23		
2A Re	esilience			
34	The resilience of medical facilities during the Kahramanmaraş Earthquake of February 6, 2023	24		
143	Loss of Hospital Functionality Following Major Earthquakes	25		
50	Developing a methodology for bridges-preservation based on scalable-resilient structures	25		



106	Real-Time Hybrid Simulation of Damped Transportation Structures
204	Experimental investigation of water loading for an inclined bridge due to flood overtopping
299	An Approach to Accessing Earthquake-Induced Debris from Collapse of RC Frame Structures
327	Hydro-structural Analysis: Assessing Flood Phenomena and Truss Structure Response
2B Fr	om Design to Construction
56	The Blue Ridge Parkway Bridges - Automation in Precast Segmental Design and Construction
61	Improvement of Al Shindagha Corridor with Infinity Arch
66	Research on the design and application of cable-stayed bridges in China
67	Study on Steel-Shell Concrete Composite Section Bridge Tower Based on Solid Finite Element Analysis:
	A Case Study of The Guanyinsi Yangtze River Bridge
99	National Route No. 32 Bridge over the Virilla River in Costa Rica
101	National Route No. 147 Bridge over the Virilla River in Costa Rica
313	Boosting Design Eciciency by using BIM for a Major Railway Project in Nigeria
2C Re	ehabilitation of Existing Structures
31	Surrogate Modelling of Bridge Deterioration Using Machine Learning and Defect Data
86	Analytical Study on Changes in Contact Pressure Distribution due to Expansion of Bulb Sleeve Annealing
	Range in Huck One-side Bolt Used in One-Side Construction
89	Widening and Replacement Project of the Deck Cross-Section and Cables of the Centenario Bridge in
00	Seville (Spain)
98	
228	Italian perspectives on seismic retrofitting: unraveling the state of the art in building isolation techniques.
325 20	Supplemental Damping of Rocking Systems Coupled with Pressurized Sand Dampers
20	Eurocode 2nd Generation - The Future of Fatigue Design in Steel
2D In	tegrated Design
73	Analytical study on increasing slip strength of high-strength threaded stud-welded frictional joint with
	inorganic zinc-rich painted surface for a thin steel plate
116	Performance-based design of continuous concrete bridges accounting for life-cycle analysis and sustainability
121	Durability and sustainability in CSA S6:25 Canadian Highway Bridge Design Code – A unified service life
121	design process to cover all structures and materials
265	Use of digital data for rail infrastructure management
268	Independent checking of Bataan Cavite Interlink Bridge, Philippines
150	Analysis of settlement ratio of pile group under vertical load using FLAC3D
95	Extension of the road bridge platform of the XIX Century
21 Da	esilience
145	Recommended Design Criteria and Implementation Strategies for Seismic Isolation
174	Regulatory Compliance and Implementation of Seismic Protection Technologies in Latin America
180	Multi-angle and nonuniform ground motions on cable-stayed bridges
224	Resilience-based decision making for transportation infrastructure
234	Performance evaluation of 8 base-isolated hospitals during 06.02.2023 earthquakes in kahramanmaras,
345	turkey Design and Application of Internal Damping Device for Stay Cables
0D E	
	om Design to Construction
105	Data-driven design process and production of stress-optimized concrete girders with integrated tendons
447	using 3D printing
117	Viaduct Solutions for Unstable Slopes in the Kicking Horse Canyon
129	The new Johns Hopkins Student Center: designing for constructability
169	Study on the evolution of shear crack in concrete beams reinforced with grid reinforcement
193	Developments in accelerated bridge construction in the United Kingdom – integrated design and construction
221	Validation of a new mechanical model for geometrically and passively confined concrete



3C Re	ehabilitation of Existing Structures	
235	Retrofit Bridges using BIM techniques	57:
247	Fatigue life improvement of welded cover-plates using High Frequency Mechanical Impact treatment	58
248	Technical rehabilitation and strengthening of the Chemnitz viaduct	58
337	NDT assessment of pylon foundations of the Swiss power grid	59
340	Replacement of external post-tensioning in bridge structures – practical experience in cutting the highly	
040	stressed tendons	60
103	Reuse – between slogans and facts.	61
103	neuse – between stogans and racts	01
2D C	offware Madaling	
	oftware Modeling	00
9	Beyond BIM: Digital Twins for 3D Digital Project Deliverables	62
63	Comparative Analysis of the Tensioning Schemes of the Prestressed Concrete Wide Box Girder of	
	Guanyinsi Changjiang River Bridge	62
77	BIM Basics in an International Context	63
126	Numerical analysis of Precast Concrete Segmental Bridge decks for High-Speed Railway lines with	
	external and internal prestressing tendons	64
179	Rebar corrosion and concrete cracking of corrugated steel web beams in chloride environment	65
195	Creating an openly accessible database for bridges and engineering models and their digital twins – the	
	bridge over the Rhine by Fritz Leonhardt as a case study	66
4A Re	esilience	
237	Experimental Study on the Performance of Steel and Composite Plate Shear Walls Under Cyclic	
	Behaviour	66
280	On the hyperelastic material behaviour of polyurethane in the context of structural sealant glazing	67
314	Fundamental Study on Control of Yield Position of RC Piers	68
163	The Tretten Timber Bridge collapse, forensic engineering	69
100	Resilience of transport infrastructure against natural hazards: attributes and indicators	69
175		70
1/5	State of the Art of Seismic Isolation Systems in Latin America	/0
40.5		
	om Design to Construction	70
227	The outstanding construction of the new Boca del Cerro bridge in Mexico	72
229	Defects of new and old facades – lessons learnt	72
230	Rehabilitation and replacement of bridges and railroad tracks of "Línea K"	73
231	Design principles to use brittle material glass for resilient facades	74
249	Bataan Cavite Interlink Bridge - Foundation Design for Extreme Conditions	75
83	Numerical and Experimental Study on the Static Performance of Composite T-shaped Piers with Steel	
	Bent Cap and Concrete Column	76
4C St	tructural Health Monitoring	
29	The potential of applying structural health monitoring to ferry docks bridges in Norway	77
62	Computer Vision-based Algorithm for Deformation Monitoring in Bridge Construction Research	77
64	Damage characterisation using stand-oc observations to enable recovery: the case of infrastructure	
•	acected by targeted attacks	78
65	Fatigue assessment of a long-span suspension bridge with an orthotropic deck in aluminium	79
71	Damage Detection in a Steel Arch Bridge Model Using a Convolutional Neural Network Focused on the	/ 3
/ 1		0.0
222	High Frequency Bands.	80
223	Field tests on two structures to assess integrity, efficient maintenance strategy, soil/structure interaction,	
	risk profile, and seismic response	81
	panish: Seismic Codes in Latin America	
	ustainability	
270	Experimental Approach Toward Reliable Heat Transfer Coefficient on Building Envelopes	81
281	Resource expenditure for bridge structures in Sweden – do we build greener bridges now compared to 50	
	years ago?	82
300	Sustainability through material optimization in Mumbai Trans Harbour Link Package II	83
338	Evaluation of reductions in carbon emissions from building construction due to innovative approaches	
	to floor construction	84
341	Sustainable Infrastructure – Assessing the environmental impact of bridge construction	85
O'T I	Castaniasts initiatitation / 100000mb the childrin childrin pactor bridge constitution	Ů,



271 154	New hybrid monitoring method using moving vehicle for investigation of bridge dynamic parameters Toward Universal Accessibility: Application of Mixed Reality in the Modernization and Adaptation of
93	Pedestrian Bridges. A Systematic Review Analysis of impacts and vulnerability of structures due to the effect of climate change
5B So	ftware Modeling
198	Experimental Analysis of Costa Rican Partially Grouted Masonry for Micro-Modeling Integration
215	Numerical parametric study of LWT-FLOOR composite system: ecect of various web openings
257	BrIMMS – A Software for Inspection and Maintenance Management of Bridges
263	Open source analysis software: an opportunity
294	Development of Time-domain Aero-hydrodynamic Coupled Analysis Module by ABAQUS User Subroutine for Floating Bridges
311	Optimization of prestressing operations in the design of cable-stayed bridges by applying the Direct Algorithm
315	Multi-Level Above and Below Ground Parking Structures; Capital Project Improvement using Building
313	Information Modeling BIM (Revit, Infraworks & Leica 3D Scan Models.)
EC Da	weeks and Autonomous Technologies for Bridge Increation
	emote and Autonomous Technologies for Bridge Inspection
130	Portable depth sensing with the iPhone time-of-flight LiDAR.
149	Detecting railway bridge scour using in service train signals and machine learning tools
153	Bridge Inspection and Monitoring using Mixed Reality: A Systematic Review
156	Monitoring and evaluation of tension loss in cables of cable-stayed bridges: a case study
166	Prototyping Fully Autonomous Bridge Visual Inspection based on mobile robots with visual recognition capabilities
329	Geometric Digital Twins of RC Bridge Point Clouds using Instance Segmentation
208	Predicting long-term service performance of a prestressed concrete bridge using a probabilistic method
	and remote bridge inspection technologies
5D Fr	om Design to Construction
92	Rapid Bridge Replacement of the Highway 400 Overpass in Toronto, Canada
157	Construction of J.P. Magufuli Extradosed Cable-Stayed Bridge (3.0km) at Mwanza, Tanzania, near
107	Kigongo/Busisi Ferry
14	Maintenance Strategies for the New Samuel De Champlain Bridge
199	Bridge Digital Twins Creation Using an Unorthodox Approach
15	Analysis of inelastic buckling of i steel beams in different standards and numerical method
138	Functional Recovery and Rehabilitation For New and Existing Infrastructure
275	Análisis comparativo del proceso constructivo del puente atirantado Pumarejo en Colombia vs el puente
	atirantado asimétrico de treng-treng y kay-kay en chile
	ructural Health Monitoring
107	Study of Doming in Structure from Motion for Retaining Wall Inspection
115	Load rating of an in-service bridge integrating Bridge Weigh-in-Motion data and load test results
182	A New Solenoid-Type Sensor for Nondestructive Stress Estimation in Prestressed Steel Strands
254	Structural Health Monitoring of an Incrementally Launched Extradosed Stay Cable Bridge in Lesotho
267	Proposal for the Extension of Simulation Models by Integrating a Virtual Sensor Concept into the
	Monitoring Process of Load-Bearing Glass Façades
262	Instrumented micropiles load tests at future Bridge El Salvador - Guatemala: some insights
45	Innovation through Value of Information of the Interpolation Damage Detection Method: an experiment-
	based value quantification
6B De	emand Loads
3	Post-earthquake observations of bridge damage
52	Full-probabilistic reliability approach to calibrate tracic load models on highway bridges
58	Forensic Analysis of Historical Failures of Bailey Bridges over the Balsa-Santa Clara River and the
	Cataratas River in Costa Rica
97	Structural Performance and Failure Modes of Cantilevered Porcelain Posts in Overhead Railway
<b>J</b> ,	Transmission Lines
194	Multirisk assessment for long span cable stayed bridge in bangladesh
	a.ao access.mont for tong open ounte stayou prings in bullgludoulininininininininininininininininini



303	Prioritization of structures for reassessment considering the value of information
104	A Reduced-order Modelling Approach for Vibration Mitigation Design of Long-span Suspension Bridges
6C Sr	panish: From Design to Construction
55	Puente (colgante) Hålogalandsbrua: un desafío dinámico en el Círculo Polar Ártico
289	Validación numérica del comportamiento para un prototipo de galápago (saddle) del cable principal de
25	un puente colgante
35	Diseño y construcción del puente K58, puente aislado en zona de alta sismicidad. Analysis and design
100	of K58 Bridge, Isolated Bridge in a very height seismic zone
188	Ingeniería de Construcción: Análisis del detallamiento en cimentaciones por micropilotes y conexión
201	monolítica en puentes del Uruguay
291	Diseño de vigas postensadas en el puente sobre el arroyo riachuelo en ruta 1 (uruguay): comparativa
319	entre normativa local y AASHTO LRFD
319	·
108	santiago de chile
100	interaction
148	Seismic behavior analysis of the Puntarenas Cathedral to evaluate the need for structural restoration
140	Seistific beliavior analysis of the Fundalerias Cathedral to evaluate the fleed for structural restoration
6D Fr	om Design to Construction
16	Could a grouped design approach of bridges increase productivity and decrease cost and climate
	impact?
266	Design of multifunctional space structures
258	A Case Study of Design & Construction Challenges in Ranchi Elevated Structure project, India
320	Comparison on the behavior of reinforced concrete frame structures designed with low ductility and high
	ductility
323	Fibre-reinforced post-tension anchoring zone – an experimental comparison of reinforcement
	configurations
139	Component Testing of Pressurized Sand Dampers to Assess the Ecect of Design Parameters
74 C+	ructural Health Monitoring
279	
286	Bridge Support Assessment Through Deflection Analysis Captured via LiDARUAV-Visual Inspection: Bridge Condition Assessment Over a Decade
306	Seismic analysis and environmental vibration testing of the Infiernillo I bridge, Michoacan, Mexico
312	Digital Twins for asset management: platform for predictive maintenance and Trough Bridge case study
316	The Framework for a Comprehensive Bridge Management Platform Developed by Kinemetrics
321	Fundamental Study on Evaluation of Axial Force of High Strength Bolts by Digital Image Processing
321	Tundamental Study on Evaluation of Axiati orde of high Strength Botts by Digital image i rocessing
7B Al	ternative System Components
102	Effects of pedestrian synchronisation on under-deckcable-stayed footbridges
197	Steel Frames with Intentionally Eccentric Braces using Round Hollow Structural Section and W Shape
	Bracing Members
200	Calibration of a structural analysis model to evaluate the action of lateral plane loads of the prefabricated
	system of columns and masonry without reinforcement "Prefablock"
22	Experimental study on the feasibility of a centrifugal precast pipe pier with a socket connection
49	Innovative Geometry Control Techniques for Complex Bridge Construction
172	Global sensitivity analysis of cable stayed bridge models using Sobol indices
-	panish: Resilience
118	Evaluation of the seismic response of a Benchmark structure with structural control systems using Hybrid Real-Time Simulation (RTHS)
177	Study of various cross-section structures in bridges based on prestressed concrete beams with the
	objective of obtaining rationally designed, optimal and sustainable bridges
60	Elementos de borde en edificios con sistema estructural mixto con losa plana tipo cajón
287	Efectos de la corrosión sobre las pérdidas por fricción y sus consecuencias para el control del
-	tensionamiento en puentes de concreto preesforzado continuos durante obra a partir de un caso de
	estudio
324	Sismo de Turquía: algunas reflexiones desde la práctica profesional



28	Selección De Materiales y Procedimientos Para Refuerzo De Obras Patrimoniales	1434
246	Ensayos de alta performance en diferentes sistemas de aislamiento sísmico	1442
292	Retrospectiva al puente internacional general libertador sanmartín. Puesta en valor y revisión técnica	1450
7D Fro	om Design to Construction	
297	Enhancing bridge structural health monitoring through acoustic sensing: a comprehensive approach to	
	traffic analysis and incident detection	1460
57	A Forensic Analysis of Structural Failure in a Suspension Bridge in Upala, Costa Rica	1468
226	Design and construction of a 145m bow-string arch in Costa Rica	1477
261	Dynamic Load Tests at drilled shafts in sandy soil deposits to bedrock, Central Pacific, Costa Rica:	
	strategic learnings for the construction methods	1484

#### **Authors Index**

#### **IABSE Report**